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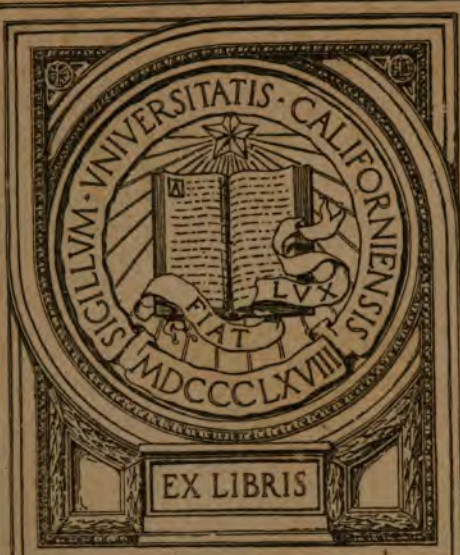

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THE ANALYSIS OF LIGHT

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A FORCE OF NATURE

BY

CHAS. M. ROUSSEAU

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1913

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Introduction.

ALTHOUGH this treatise is entitled "Light," there will be no pretense on the part of the author to offer a new theory on the subject. It is, however, the purpose of the writer to present facts, based upon simple experiments, which will positively demonstrate that light is a force of nature produced only by the expenditure of energy.

Everything in nature, visible or invisible, moves only by the application of energy. In the case of "Light," the energy is always applied upon invisible elements which, without being perceived by the eye, move and communicate the sensation of light by means of the force derived from that energy. The difference between this energy and the force of light will be fully explained.

The forces of nature, so-called, are all alike and are really but one force. The seeming variations produced are the direct result of the manner in which this force is applied upon inert matter, the elements and different bodies. This same force, acting in conjunction with certain elements, will produce and impress upon the visual nerves that which is called "Light," while this very same force, acting upon other gaseous matters, will impart the sensation of "sound" motion, or give the impression of "heat." The difference in the manifestations of these results is due entirely to the nature of the elements upon which and the manner in which the energy is applied. The force, however, is one and the same. This being so, whenever energy is applied, one or more of these results must become manifest. Frequently, light, sound, heat and motion will jointly result from the same exertion of energy, as is illustrated by the discharge of a fire-arm.

It is this same invisible force which rotates the earth, moves the ocean and the atmosphere, creates the seasons, provides those elements which are essential to the continuance of life, and gives life itself to the animals and the vegetable kingdom. A complete understanding of this universal force will be necessary before satisfactory knowledge of its various phenomena can be obtained.

Light is the result of energy, and as such is conveyed across space and felt upon the visual nerves. It is a force which can be measured and accounted for in every respect. There can be no imaginary waves of rarefied and condensed air vibrating themselves into space by a sort of perpetual motion movement, nor can we have any corpuscles of light passing through an imaginary ethereal medium, there is no cause or reason for the same.

Light is always a chemical action, while sound is a mechanical operation, and heat the result of molecular resistance. We thus have the principal differences between the three forces. Therefore, whenever energy is applied and these three actions, the chemical, the mechanical and the molecular, occur together, the result will be light, sound and heat.

There will be no attempt made to discuss the merits of either the corpuscular or vibrating theories. A few analytic experiments will prove both of these theories groundless and useless. Furthermore, it will be shown that the force of light does not begin nor propagate in the manner and by the means taught by those theories.

Light is an invisible, imponderable force which cannot be incorporated into the elements, matter or bodies, and therefore cannot be started, as corpuscles or air waves, nor set in vibratory motion, but which, by virtue of this force, can impress the optical nerves with the sensation recognized as light. All forces of nature are created by

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the undoing of some equilibrium state and, therefore, consist of two parts, one of which is the positive part, which results from the expenditure of energy, and which invariably undoes the state of equilibrium and is thus consumed. This unrestful condition calls into existence the second, or negative, part of the force, the office of which is to re-establish the equilibrium, and in that effort, to convey the force to the nerves and there impart the intelligence of what has taken place. The motion of the force to re-establish an equilibrium, therefore, is toward the site where it was undone. When this acts upon the visual nerves, it gives the impression of light, while the same force, when received by the aural nerves, imparts the sensation of sound, and when in communication with other nerves, is felt as heat. The same force, which forms, kills and renews the planets, creates, grows and kills everything upon them. It is this force which has baffled the scientific world, and from which much may be anticipated, when once understood and properly applied to the sciences, art, medicine and manufacturing.

There are many means and ways by which the resulting sensation of light can be obtained. We have light which comes from combustion as from oil, coal or wood fire, explosion and chemical combustions; the sun's or star light, which is also due to a similar combustion; electric light, incandescent light, phosphoresence and light from various substances heated to whiteness; and also the so-called reflected light, such as moon light. All bodies illuminated are supposed to reflect a certain portion of these various kinds of light. All of these different classes of light will be fully investigated, and will prove, when reduced to a general rule, to be the same identical force, in all respects.

Exp. 1—The energy spent in the discharge of a field piece produces three results, light, sound and heat. When stationed at a distance from the gun, we first notice the flash of light. This force travels at the speed of 192,000 miles per second. Then we hear the report or sound, which force travels at the rate of 1118 feet per second. A considerable difference, you will observe, exists in the rate of speed, in so far as the force of light and that of sound are concerned. We can only feel the heat by laying the hand on the gun, in other words, by direct contact of the metal with the nerves. This proves that heat is the slowest moving force of the three.

One explosion having produced the three different results, the chemical action gives the flash of light, the mechanical motion, the sound, and the molecular expansion in the metal, the heat. We learn that these three results separate themselves readily and travel independently, one from the other, from the beginning, and by different rates of speed, so that it will not be a matter of great difficulty to examine the force of light alone, irrespective of the forces of sound and heat.

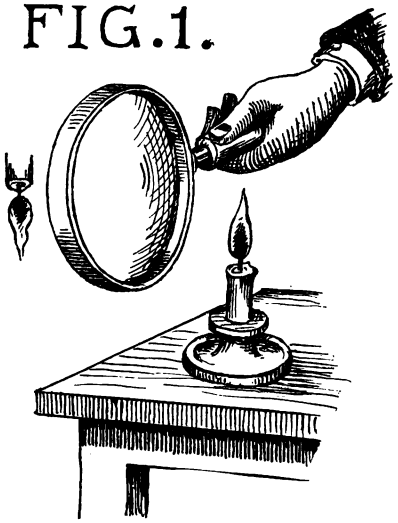
The Analysis of Light.

FIRST we must find out what light really is.

Light is one of the many forms the force of nature assumes, and is the one in particular by which the optical nerves become sensitive to objects around us. What we are accustomed to call light is the profuse image produced by the action of some luminous flame or white hot body upon an opaque surface.

Exp. 2—To illustrate by an experiment the correctness of this assertion, I will use an ordinary candle and a double convex glass lens,

FIG.1.



which is constructed upon the same line of curvature as the lenses of the eyes. This experiment is best made in the evening or in a dark room, where conflicting sources of illumination can be avoided. By lighting the candle and placing it in a holder upon a table, we obtain a luminous flame and see light. By holding the lens at a short distance from the wall, between the candle and the wall (as shown at Fig. 1), you will observe an image of the flame reproduced upon the wall (in an inverted position), showing that the action of the flame has reproduced its image.

Exp. 3—By moving or shifting the lens parallel with the wall in various directions, you will observe that an image of the flame follows the movement and that the image of the flame is reproduced continually, and at whatever place the lens segregates it from the confusion of the other images. This simple experiment proves that the blending into one of the multiple image, as seen upon a wall, is what we have been accustomed to call light.

Exp. 4—The theories of emanation and undulation claim that light emitted from a luminous flame is cast in all directions alike. This cannot be true, for when I hold the same lens between the flame and the ceiling (as shown at Fig. 2), it gives another image of itself, entirely different from that projected on the wall. It naturally would follow that the blending of those images called light at the ceiling is not the same, since it results from a different image, and differs in that particular construction from those called light upon the wall.

Exp. 5—Further, when I hold the lens near the floor (as shown at Fig. 3), I notice again a different outline of the same flame, not delineated in the same manner as those on the wall or on the ceiling. Therefore, the light resulting from the confusion of those images can-

FIG.2.

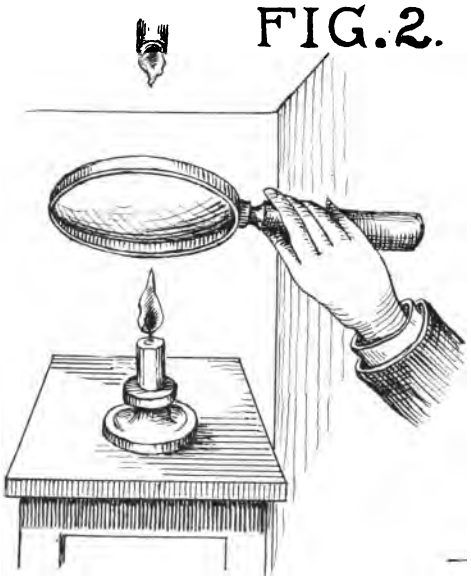


FIG.3.

not, scientifically speaking, be called the same at these different places, because the original image of the flame, from which the light is composed, is not the same. It is not important that the confusion of images called light should be composed of images exactly alike. It may even be stated that every image thus reproduced is somewhat different in outline from the next one.

Exp. 6—If I hold the lens a foot above a line level with the flame, the image delineated upon the wall is different from the one obtained when the lens is held a foot below the same level. These experiments demonstrate that no corpuscles or waves of light are required, nor do they start from the luminous flame, but that that which is reproduced upon the wall is only an image caused by the action at the combustion. They also show not only that the image resembles the original flame, with its shape and outline, but that although each image is a different one from the other, yet it conforms exactly to the original picture of the flame as it would be seen if the single image were focused by the lens of the eyes upon the nerves of the retina from that direction; for when not segregated, the confusion of the same image, when seen by the lens of the eye, produces the effect known as light.

Since all luminous images and illuminated surfaces reproduce, in this way, their images in all directions, we thus have the explanation for the reason why we can see everything around us when these are focused by the lens of the eye upon the visual nerves. If light reached the eyes in the shape of corpuscles, by vibrating air motion or waves of light, without carrying with it the image of the flame, it would be impossible to see the image. Since we cannot perceive anything outside of ourselves, to see an image, it must first be focused upon the nerves of the retina. The eyes are like the chamber of a camera, for if light enters the space behind the lens, no picture can be reproduced. If it were light, instead of the image, which is cast everywhere and in all directions, then neither the eyes nor the camera could reproduce any object. By experiments 2, 3, 4 and 5, it has, therefore, been plainly demonstrated that nothing but the image of the flame is reproduced behind the lens.

These experiments give us the basis from which we can inquire further into the causes and means employed by nature to reproduce this image of the flame and its subsequent confused effect of light. So far we have learned that light is not cast from luminous flames, as the rays of light, but that light is the result of the reproduction of the original flame seen in a confused blended form upon opaque surfaces. These few experiments place us far in advance of both theories heretofore referred to, since we know, now, that it would be useless to search for those corpuscles which are supposed to be shot from the flame through ethereal medium, as we are taught by the emission theory, and further, that the wave theory may be ignored entirely since the vibrating or wave motion of an image could not improve its sharp delineation upon the eye or upon the wall.

By further inquiries, we shall actually discover that what really takes place is the reverse of the teachings of these theories, for, no sooner have I ignited the candle than, instead of its starting vibrating waves and emitting corpuscles, it commences to substract the oxygen from the air; the motion of this invisible gas is toward the flame which moves in the opposite direction from that taught in both theories. A flame cannot cast away corpuscles or start vibrating waves, but it does certainly withdraw and consume the oxygen of the air. The nerves of the retina can feel and convey to the brain the knowledge that this invisible substraction is taking place, because it is substracted in the

shape of and in the form which corresponds with the outline of the flame, no matter from what direction it is produced. Consequently, should one image not be singled out or segregated by means of the lens of the eyes, or by some similar shaped lens of glass, the multiple blended images would appear then as one confused compound of all the original images, blended together and called "Light."

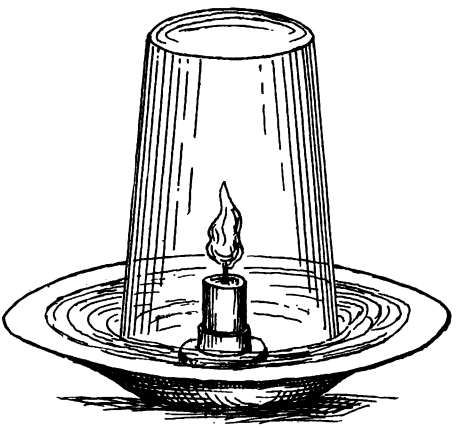


FIG.4

Exp. 7—Now, if I place an ordinary drinking glass bottom up over the lighted candle, using the precaution to rest the glass in a saucer filled with water, in such manner that no air can enter (as shown by Fig. 4), you will observe that, as soon as the oxygen confined under the glass is consumed, the water is lifted to replace the space previously occupied by this oxygen. This experiment shows, when the contents under the glass is examined, that all the oxygen has been substracted by the combustion, and that only nitrogen remains. It was this substraction which created the force which lifted the water in the effort to re-establish an equilibrium. Not being able to draw upon more oxygen, it spent its force as was disclosed by the visible motion upon the water. This illustrates how the force of light can be transformed into motion heat or sound, when the proper conditions are present.

Exp. 8—We have now presented to us the force of light, an element of no small importance. When I measure the quantity of water lifted in the last experiment, I find that in ten seconds an ordinary candle flame lifts six ounces of water. This would make thirty-six ounces per minute, which is equivalent to three pounds of water, or one hundred and eighty pounds per hour and more than two tons of water in twenty-four hours.

This experiment shows that work and labor can be done by the force of light and, as nature employs nothing but this force in all its work, it will certainly be a step further in the march of progress, when once this force is sufficiently understood to enable us to appreciate the simplicity in the method employed by the sun, whereby it rotates the earth, produces the seasons, magnetizes the poles, rocks the ocean, shifts the atmosphere, purifies the air and provides the needs of life.

It is this same force which, when focused upon the nerves of the eyes, draws in similar manner upon the elements of which the optical nerves are composed (oxygen and hydrogen), and which creates a difference of density further recognized at the brain as the sensation of light.

Nature's Force.

THE force of nature is invisible and imponderable and, as it is entirely foreign to matter of any kind, it cannot be incorporated into any of its parts or branches. All matter is inert and cannot move, live, grow or die without this force, which is its prime motor. Even the Universe, with all its stars and planets, follows faithfully the simple rules set down by this imponderable force. It is therefore the only medium nature employs to do its work.

I have made a distinction herein between energy and what I have termed the "Force of Nature," because the former must always be used to create the latter. No force of nature can be started without the use of energy. It is only by the action of this energy that an equilibrium can be rendered into a non-equilibrated condition. It is the effort of these non-equilibrated parts to re-establish the equilibrium which constitutes the "Force of Nature."

The force of nature consists of two parts, the positive, which invariably results from the energy which undoes the state of equilibrium, and the negative, which re-establishes it. It is the latter force which conveys and imparts the intelligence of light, sound, heat and other phenomena.

All elements, bodies or matter of any kind, to be in equilibrium with their surroundings, must have the same density as the surrounding medium in which they exist. When some energy undoes that equilibrium, the positive force starts the negative force and thus conveys the knowledge of what is taking place.

Exp. 9—When I ignite the candle, I use my personal energy. This is kept going by the energy in the combustion, which creates the positive part of the force by withdrawing the oxygen from the atmospheric mixture. In this way the state of equilibrium is undone by the changing of the density of the air, which in a state of equilibrium is composed in each 100 parts, by weight, of 23.01 oxygen and 76.99 nitrogen. When the oxygen is absorbed and consumed, only 76.99 nitrogen out of 100 in weight remains. It is this difference in the density which is the negative part of the force and which further conveys and imparts the sensation of light. It was this same differential density which, in Experiment 7, lifted the water in the glass.

When the oxygen rushes into the free nitrogen to re-establish equilibrium, it conveys the differential density along and upon the wall and the lenses of the eyes. It is this force of difference of density that is recognized by the nerves and brain as light, when it produces upon them the same relaxation of differential density.

It has been proved by Experiment 7, Fig. 4, that the oxygen under the glass was entirely consumed and, as the remaining nitrogen was an incombustible gas, the flame was extinguished. Therefore, if a candle were to burn in the free air, after it had consumed all the oxygen in the space immediately surrounding it, the result would be the same. The incombustible nitrogen would instantly extinguish the flame. This proves that although both gases are invisible, the oxygen is necessarily, in the course of combustion, replaced and rushes immediately towards the flame in proportion to and in quantities equal to the amount withdrawn. Assuming the form of the flame, it draws in all directions and in this manner reproduces its own image. When this is focused singly upon a wall or upon the retina of the eyes, this force of differential density is the image you see, while when it is not singled out, the confused forms of the force of differential density is what produces the sensation of light.

I have tried the difficult task of explaining how nature's work is accomplished in the phenomenon of light, when invisible gases are actuated. I can, however, demonstrate the principle of nature's force much easier by other experiments made with visible objects, and where you can see the inert matter move in obedience to this same invisible and imponderable force of differential density.

In philosophy, it is known that the density of a body indicates the quantity of matter contained in it under a given bulk; and, as all matter has certain known density, if a body of equal bulk with another is double the density, it contains double the quantity of matter. For instance, a cubic inch of water at 60° barometer 30′, weights in air, 252,458 grains and is 315 times heavier than air at the same temperature; therefore, it is evident that an ordinary piece of pine wood, one cubic inch in dimensions, which weighs, under the same condition, 140 grains, cannot be in a state of equilibrium in either water or air, because of the difference in weight, which is also the density.

When matter is in that condition and is free to move, it will invariably move, by means of this force of differential density, toward the strata of least resistance. This is always towards that of equality in density, and where it will rest when it reaches the equal density, in a state of equilibrium.

Exp. 10—This can be demonstrated, experimentally, by using the block of wood which, when released, as it is held at some distance from the ground, will fall thereon, because it cannot be in equilibrium when surrounded by air having less density. Now, if the same piece of wood be held at the bottom of a bucket of water, it will rise to the surface as soon as it is released, because it is not in equilibrium, and on account of the fact that the water is denser than the wood. Here we have an example of two opposite motions executed by the same piece of wood. The reason that this same block of wood can travel in opposite directions is because of the action of the force of differential density. The stimulus in either case is not located in the wood, the water or the atmosphere. These, like all substances, are inert and could not assist the block of wood, nor is it due to any changes whatsoever occurring in their component parts.

The wood being denser than air, represents the positive part of the force which carries it downwards, but, when immersed in water, the wood becomes the negative part of the force, and the water the positive. The water then consequently lifts it upward, by the same force of differential density which is here plainly shown to be foreign to the matter or elements at play.

Exp. 11—The same thing would occur with a balloon inflated with light gas, which would rise swiftly at the start, then slow up its motion in proportion as the difference of density of its bulk and of the surrounding atmosphere is reduced in the ascent, and would finally stop rising, when both the density in the bulk of the balloon and that of the air displaced are alike. No differential density existing between the two, the balloon would be in a state of equilibrium. It could then neither rise nor come down. But as some of the gas would escape, the least differential density existing would change the condition of the equilibrium, and the balloon would drop. When the balloon goes up, the air is the positive part of the force which lifts it up, but when it comes down the balloon becomes the positive part which carries it down. The condition interchanging the force illustrates how the same force of differential density, acting upon visible objects, does its work upon the gases of the invisible atmosphere in the phenomenon of light.

Exp. 12—Another experiment, illustrating the same principle, can

be demonstrated with an egg, placed in a glass of water, which will sink to the bottom of the glass. If, however, we change the density of the water by adding salt, the difference of density can be adjusted so that the egg may be made to float, or appear hanging in the middle of the liquid. The latter condition takes place when the density of the egg and that of the water and salt are equal. This again proves that it is the force of differential density which is the cause of the motion.

This invisible force has been attributed by Sir Isaac Newton to some mysterious energy called the central attraction. It is stated that Newton, sitting one day in his garden, and seeing an apple fall from a tree, was led by this circumstance, to reflect upon the causes why bodies fall to the ground. He ultimately concluded that all bodies in nature exert a mutual attraction upon each other, at all distances, by virtue of which they are continually tending toward each other. Newton believed that matter had the power to attract and was not inert. This erroneous conception of the fourteenth century is still found in our school books.

In our experiments we have found that the cause, which propels a body downward and upward, is the force acquired in the differential density, that it is the result of the unsettled equilibrium existing between those bodies which are in immediate contact and which is the force of nature. This was further proved by the experiment with the balloon, which showed clearly, that once no differential density exists between the air and the balloon, it cannot move up or down. This was also proved by Experiment 12, with the egg. If the apple of Newton would have fallen upon water, which is a liquid, the apple should follow its supposed inclination toward the central attraction; but, to the contrary, we see, by trying the experiment, that the apple is lifted immediately to the surface of the liquid by the superior density and floats. The apple, being the positive and superior density in the air, becomes the negative part of the force in water. No apple, metal, rock or any heavy substance we know of, could ever reach the center of the earth, as it would soon meet with the superior density of heat, melt, evaporate and actually rise as vapor before it ever reached a distance of twenty miles. All of which goes to show that the attraction theorists have very little with which to substantiate their theory. Both the center and upper layers of the earth can be reached only by means of similar equal density. All matter being inert, it cannot possess the power to attract or to move. The reason a rock falls to the ground is because in time the density of the equilibrium has receded lower toward the bowels of the earth. It is this differential density which is the force which carries it back now toward that state of equilibrium. The fruit grown from the apple blossom, from elementary matter heavier than air, when detached from the tree, obeys the same rule and falls, by virtue of the same force of differential density toward equal density, and can never reach lower down than the strata of equilibrium as the force would then be annulated. Even the candle flame cannot attract oxygen. The energy of the combustion, once started, consumes it and in so doing undoes the state of equilibrium of the air. This is the force of differential density conveyed and felt as light upon the visual nerves.

Exp. 13—The truism of this argument can still further be proved by reversing artificially the order of natural density in such a manner that slightly denser air is made to rest above an object instead of below. In this case the object could not fall toward the natural density, but would rise toward this superior artificial density in trying to reach the state of equilibrium in that direction.

FIG. 5.

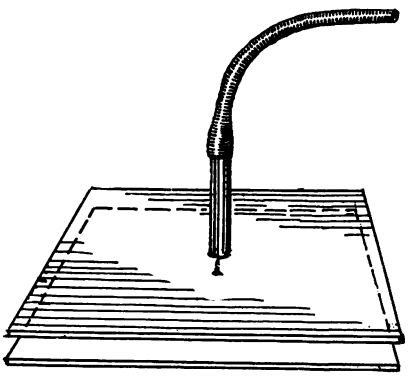


FIG. 6.

This condition can be attained experimentally by using a small wooden ball, one inch or one and a half inches in diameter, fitting loosely into a cup of corresponding shape to which a rubber tube is attached, as shown by Fig. 5. By blowing hard against the upper part of the ball through the rubber tube, the air will become more dense above than below, and you will observe that the ball in attempting to rise by reason of its tendency to move toward the denser strata and against the strong gush of wind, will rotate freely without support and continue to do so as long as the upper density is maintained.

Exp. 14—It is not even necessary that the object should be of round form, as the same result can be attained with objects of any shape. As long as the stronger density is at the upper part of the object, it will not fall, but will tend to rise toward this superior artificial density. This proves conclusively that all objects move only by the force of differential density in contact and not on account of any distant attraction. The last experiment can be made by using two squares of equal size, made of some stiff cardboard about 3 to 4 inches wide, into the center of the upper one of which a rubber tube should be inserted, so that you may blow against the upper flat surface of the lower disk (as shown by Fig. 6). A pin should then be inserted in the lower board to fit into the tube and to guide the same and prevent it from sliding from its position. When the gust of wind is applied the upper density over the lower disk holds it from falling and it then appears suspended like the ball without support. The excess of density above the plane of the aeroplane, caused by the swift revolving of the propeller, gives the reason why a machine heavier than air can be lifted from the ground and can be used to navigate the air.

These few experiments show how the force of differential density acts by moving visible bodies from the non-equilibrated state to that of an equilibrium. It is the same force which acts upon invisible gases, after the combustion has undone the equilibrium in withdrawing the oxygen from the air. This motion in the invisible gases becomes visible to the nerves of the eye when it acts upon them as the force of differential density of light.

Since the strata of density of the planets decrease from the center to the outer layer, all solid bodies can only move up or down to find their state of equilibrium in density. In gaseous matter, the state of equilibrium requires the changing of an existing uniform density

into two unequal kinds. This is what produces the difference which tends to equalize both into one and in so doing conveys the force to the nerves. The force of light is the difference in density between the density of the nitrogen (76.99) gas left after the combustion and the density of the original atmosphere (100), and is equal to 23/100, nearly ¼ of the density of the air. It is no more possible that the nitrogen fills the space previously occupied by the oxygen, because of this ¼ difference in the density, than a three-foot cube could fill the space of a block of four cubic feet. The two gases act like two solids or two liquids of different densities. Quicksilver, for instance, will fall through water, while oil will rise above it. Each takes its place by the order of its density. So, therefore, as oxygen and nitrogen are mixed gases, not chemically combined, when the oxygen of the air is consumed, only other oxygen can fill its place, and in this way convey that difference of density of 23/100 to the nerves which is the force felt and recognized as light.

The nitrogen of the air cannot dissolve its density into the oxygen, as when a solid, which can melt, is placed in a liquid in which it can dissolve, the solid, by its superior density, will penetrate and dissolve its density into the liquid until the difference between the two densities is annulled. This proves that it is the same force of differential density which causes sugar, salts and all soluble substances to melt in liquid until both are in equilibrium. By adding more density to the water, by means of heat, we find that more salts may be dissolved, but never more than the difference between the two densities.

In many cases this force of differential density in nature is brought about so slowly that it is hardly perceptible. It is often, through various causes, prevented for long periods of years, from acting, as for instance, the solid crust of the earth, which was originally formed in a strata of perfect equilibrium, finds itself today many miles above the present real equilibrious state of density. We, therefore, have represented the positive force which would bring it back into the lower strata, its equal in density.

The force which has brought about this condition is the cooling of the planet. The force of heat, having left, has caused the strata of heat density to sink lower, but as the outer spheric shell is of solid matter, it has been unable to follow the receding movement. This loss shows the reason why a boulder or stone, which becomes detached from a cliff, falls toward this receding density. It would continue to go down until it reached the strata of equality, but is prevented, however, by the spheric self-supporting crust of the earth. The whole crust of the earth is under the same strain. It, too, would fall to the strata of equality, but is prevented by being keyed like a stone of an arch. However, the weaker portion gives away occasionally and responds to the strain. This has produced the unevenness of the earth's surface. Our projecting mountains are proof that the original large area of the circumference has been reduced into a smaller space, while their geological structure shows plainly how the caving in took place. The mountains also show that it has been impossible to reduce the former large superficie into a smaller compass without causing some portions to top out and project. The continuance of this work makes itself felt in the form of earthquakes. All the solids, liquids and gaseous matter of which the earth is composed, work their way toward that equilibrated condition, which the sun, by its positive force, continually undermines, and it is that effort to re-establish the equilibrium, opposing the solar force, which we appreciate as sun light.

The sun reproduces its image upon the face of the earth and other planets by the same means as the candle flame does its work on the wall, all of which we have learned was done through the undoing of the state of equilibrium in changing the density by withdrawing the oxygen used in the combustion.

The sun also withdraws the gaseous element used in its combustion and produces thereby the force of differential density of sun light. It is that same force which has, in the course of time, reduced the earth's bulk and caused it to cool and shrink and which has limited its caloric to a deeper strata in the bowels of the earth.

When we come upon the scene, we find everything solid and liquid pressing inwardly by reason of this force of differential density. This force is the weight of matter, and is proved by the fact that the surrounding density alters the weight. A boulder weighing many tons upon the surface of the ground, would weigh less than its surroundings, if it could be held without melting in the great density at the center of the earth; in fact, it would actually rise on account of its lightness to within 25 miles below the surface where it would be again in equilibrium with its surroundings, and have no weight at all. While on the top of a mountain, this same rock would weigh much more than it would in the valley, on account of the difference between the two densities, which increases because of the rarification of the atmosphere. Therefore, weight is only a matter of differential density. A balloon will rise, a rock will fall, water will flow to a lower grade and into the ocean by the same force of differential density which produces weight and motion and which is also the force of light.

Because matter is inert, nothing, ever so small, can be added or taken from the planets. Everything on earth and in the universe remains stable and can only be brought into action by this force of differential density. The earth cannot cool or shrink unless the energy at the sun's combustion produces the force of differential density by withdrawing some element from the planet. This gathering in space is then used in the sun's combustion. The planet has, in this way, been placed in the plight it is today. It is this withdrawal of density which our visual nerves recognize as sun light.

We thus become aware that inert matter must be everlasting because it cannot be destroyed nor increased in quantity. It may be used and can undergo chemical changes, or may be moved by the force of differential density from a planet to the sun, yet, nevertheless, the elementary matter remains indestructible, and will last and exist until eternity.

The force of light obtained from a candle flame is derived from the consummation of the oxygen in the air which combines with the olefian gas derived from the evaporated tallow. This chemical combination produces carbonic acid and vapor of water. All the elements exist and remain part of our planet, although a new chemical combination is created which leaves the nitrogen of the air free and becomes a component of vegetable life. Nothing is lost. We find that every element is taken from, and yet remains part of, the planet. We thus have the reason why our electric flashes, fires or other attempts to communicate by such light, never will make any impression upon other planets; for the force of differential density of light cannot reach and draw upon the visual nerves of their inhabitants, since the oxygen, which is absorbed at the combustion and is the main factor in producing the force of differential density, is entirely provided by our atmosphere. It cannot, therefore, impress outside worlds, nor can

they, for the same reason, with their fires consuming their oxygen, impress our visual nerves.

At the sun's combustion this is different. The element used in this combustion is derived from the earth and other planets. It is this withdrawal of the invisible gas which is felt as the force of differential density of sun light. It is the force which produces such havoc with matter on and about the planets, as is evidenced by wind storms, tornadoes, earthquakes, volcanic eruptions, electric storms and tidal waves. It is also the force which rotates the earth, magnetizes the poles, causes the seasons, rocks the oceans and procures the elements required in the life of the vegetable as well as the animal kingdoms. As all matter and the elements composing the vegetable and animal bodies are inert, this force of differential density may be considered to be life itself. One fact is certain, that no life can be sustained in the vegetable or animal kingdoms without the constant maintenance of this force.

It therefore follows that light and life are closely connected in this respect, and much alike in chemical operation. The candle flame must be provided and properly fed to maintain the energy of the combustion. This must be surrounded with oxygen so that the energy can produce the force of differential density which carries the sensation of light to the visual nerves.

In the same manner, if the animal body is not surrounded and provided with pure wholesome oxygen, it cannot produce, in the consummation, the force of differential density of heat necessary to life, nor that which is needed to build, grow and replace the waste which is constantly taking place.

The sun is in the same condition; the flames must be fed with suitable ingredients; it must be surrounded with the proper combustible gas, one that can combine and produce the flames, so that by undoing the state of equilibrium, it will create and convey the force of differential density. This is the light to our optical nerves. It is the same force as that which is called candle light, life, heat, weight and which causes the motion of the planets and everything upon them.

The element consumed at the sun's combustion must be procured in vast quantities and must have chemical affinity in order to unite with the evaporated gaseous matter derived from the heated core. The chemical affinity alone shows that the force of differential density was created by the undoing of some previous remote equilibrium when the star was a planet, and that it now resumes a state of equilibrium by reuniting with the element it had parted from. Before this gas can unite with that derived from the sun, it must first reach below the flames. This is also the case with the candle flame. A vast dark space must exist under the sun's flame, which is in all respects equal to that which is seen, on a smaller scale, below the candle flame. (Fig. 7, at a.)

In these experiments we can almost see the molecular expansive force of heat transformed into the chemical force of light. Heat is a force of differential density due to expansion, which can be communicated only from molecule to molecule, which must be in contact. It never can produce luminosity, because it requires chemical energy to undo the state of equilibrium by substracting the element used in

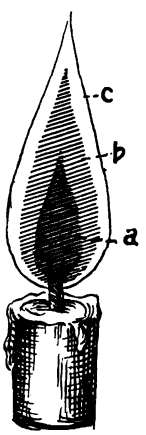


FIG. 7.

A. Dark space where gases are heated.
B. Evaporated gases.
C. Luminous flame.

the combustion. Heat undoes the state of equilibrium by compression during the expension of the molecules. It does not draw upon anything, or add any element. Its force of differential density is different and of a kind that cannot affect or act upon the visual nerves as light. This is the reason why the space occupied by the hot evaporated tallow below the candle flame is not luminous, as can be verified by looking at the image reproduced on the wall. It is also the reason why the sun shows dark spots at the places where the flame is cast aside and where the hydrogen gas enters to combine chemically with the hot evaporated gas derived from the inner core of the sun.

It would be ridiculous to expect that the sun would feed upon meteors, rocks or other solid matter as claimed by some theories. The sun is a wornout, decrepit planet to which the name of star has been applied and which has, and is yet, recovering its loss of heat, by assimilating by fire the same element it parted with during its planetary career. The earth shrinks and cools because it loses the same element the sun gains. This makes the earth become denser by solidifying more and more. At some future time, by reason of this process, the whole earth's surface will be solidly frozen. This condition would have occurred long ago, but for the wise provision of this force of differential density, which has forced most of the solid earth downward into the warmer and denser receding strata, in proportion as the heat has withdrawn toward the center. A proof of this can be found when looking upon high mountains which have not sunk as much toward the strata of density as the valleys and where above the life line nothing can exist, and where water is solidified into perpetual ice. This shows that when the earth can shrink no more to meet this receding caloric, as no heat can enter from the outside, the whole face of the earth will eventually become a frozen and desolate place.

Furthermore, a meteor composed of nickel, iron, rocks, etc., like those pieces found occasionally, could not be useful as combustible matter with which to feed the solar flame; for in that condition it could never reach into the solar mass and would very likely be evaporated long before it came near the visible flame by the intense outside heat. There is also another very important reason why the very existence of those meteors is doubtful. The appearance of a meteor may be nothing more than a reflection of the sun at night, operated on the same basis as the boy sends, through the medium of a mirror, this image of the sun into your eyes when you least expect it. Of course, nature has no mirror, but it has a very good substitute in the layers of frozen water which float at high latitudes before they melt to sink into denser strata and fall as rain. We can see the confused images of the sun upon the moon's surface at night, called moon light. Why cannot the same thing occur when the image of the sun is reproduced by these floating frozen surfaces? If ice can form on high mountains, there is no reason why this very ice could not exist in transparent layers still higher up where the temperature is colder. When this surface is inclined at a proper angle of reflection with the eyes, which occurs at certain seasons, there is no doubt that it is the sun's image which plays the role of the shooting star. This is all the more so because the shooting star crosses space with a velocity which no real heavenly bodies of any size could ever attain. Furthermore, the shooting star disappears as suddenly and as mysteriously as it appears, when it is out of the angle of vision. The phenomenon, therefore, is nothing more than an optical illusion. Where do these meteors come from? No planet can be blown to pieces. Even if dynamite were used and placed at the center of the earth, and the entire crust blown 100 miles in the air, every piece would return, and by virtue of the force of dif-

ferential density, would resume its globular entirety without any one of the pieces starting away in meteoric fashion. It is even a fact that the pieces which become detached from the moon (often mistaken for meteors), which is part and body of our planet, must fall back upon the earth, although the moon is 250,000 miles from its surface.

We must not lose sight of the fact that all matter is inert, and cannot move, attract or repulse. It is the force of differential density which actuates all the phenomena of nature. No meteor could rush or fall into the sun unless it had been at some anterior time lifted from it. A rock cannot fall upon the earth unless it is first lifted from it. So the undoing of the state of equilibrium creates the force of differential density which causes its return. This is the reason why the sun can assimilate now a certain gaseous element, for this element was originally taken from it when it was a planet. It is by the force of differential density, then created, that it can now reassimilate it again.

All the heavenly bodies are self-supported in space. This means that they are all in a state of perfect equilibrium with their surroundings. The whole earth and its atmosphere, situated at 91,430,000 miles from the sun, has no weight and no differential density with the surrounding gaseous mediums of density. This can be readily understood, when we figure that at the sea level the atmospheric pressure on our planet is 14.7 pounds to the square inch, while this pressure diminishes to 10 pounds to the square inch, when receding 5 miles away from its surface. Still further up, the pressure falls to 5 pounds to the square inch, and still further to 1 pound. Finally, at some undefined distance, it falls to 0 pound per square inch. At this point the whole planet, its atmosphere, satellite and all, weighs absolutely nothing and rests in perfect equilibrium of density with the gases which surround it.

We are naturally led to believe that such a mass of matter as our planet represents, could never rest in an equilibrious state in a complete vacuum. There must be some gaseous element pervading through space, even admitting it be the most attenuated condition possible. It must be from this gas, just as the candle flame is fed by the surrounding oxygen gas from the air, that the sun derives its supply of gaseous element. From the surrounding space in contact with the outer body of the sun, which is being constantly renewed as it becomes consumed, a vacuum of this element is created, which is conveyed to the planets and is the force of differential density of light.

Once this is established, there are yet two questions to be answered. One is, what is it composed of? The second is, where does it come from? Both questions can be answered for the candle light as well as for the sun light. There is this exception, however. We know, already, that oxygen is consumed at the candle flame, but as this oxygen is used daily, for many purposes, in enormous quantities, it is evident that we must inquire whence it comes, in order to learn how it becomes renewed.

To give an idea of the amount of oxygen used daily, I shall enumerate some of the ways in which it becomes consumed. To commence with, we have upon our planet a population estimated at over 1,500,000,000 inhabitants. Each person consumes his share of oxygen daily. Consider the amount of oxygen used to build up the bodies of and the waste of these 1,500,000,000 people. This represents at least 15,000,000,000 pounds of living animal matter, composed mostly of oxygen and hydrogen element.

We have also to take into consideration, the oxygen consumed by the fires required to cook their meals, and to do their washing and

other incidentals. To this must be added the oxygen consumed by the fires of boilers used in running machinery, for manufacturing purposes, as well as for melting, casting metals, and for transportation on land, river and sea. In addition, we have that which is used up by the electric current, gas, steam heating, hot water, waste by prairie fires and conflagrations of cities. Then there is the oxygen used by animal life, both on land and in water, and that used to build up their bodies, and for the creating of the vegetable tissue, flowers, fruit, trees, etc. Added to all of this is the enormous amount of oxygen used constantly in the formation of rain water, snow and clouds at high latitudes, where one atom of oxygen is taken from the air and combined with two atoms of hydrogen of space to form the fluid known as water. The water then falls by virtue of the superior force of density attained in the combination and returns to the earth, where it is used and accumulated in the lower depressed cavities which form our oceans.

The annual rain fall on the land of the entire globe amounts to about 30,000 cubic miles. All these items, taken together, would certainly suggest that the present supply of oxygen cannot be everlasting and that, unless it be procured in proportion as the supply is consumed, it will soon be entirely consumed. This is particularly so, in that we know from experiment that the available supply of oxygen in storage around us cannot be, at the present time, over many miles in height. This has been proved by aeronauts who, when reaching an altitude of seven miles, have become unconscious and at the same time lost the power of sight, and their senses becoming numb. Some have even lost their lives in this altitude, for at that height the atmospheric air is not fit to support animal life. Even at the height of three miles, we cannot find many who can endure the strain of the rarefication. Even timber and vegetation grow far below that mark.

As the earth has 190,000,000 square miles of surface, taking this air at an average of three miles in height, we have 591,000,000 square miles of atmospheric air fit for human use. As the oxygen is about one quarter of the air, this will allow us 122,750,000 square miles of oxygen. These deductions are based upon the supposition that the entire area is of the proper density. Experience shows, however, that it is not, since at two and a half miles above sea level, vegetation cannot grow. Now, admitting that everything using oxygen could consume and waste about 300 cubic miles per day, 109,500 cubic miles of oxygen would be required per year. If this were not replaced in time, in less than 1200 years, nearly all of the available oxygen of the atmosphere would be gone. The age of the earth is much older, and being composed of inert matter that cannot be destroyed, it will exist forever. We must remember that this same oxygen has been procured and used many million times over and over again, since the start of the planet.

Everything changes and moves continually. The earth revolves on its axis once every twenty-four hours and completes its course around the sun in the period of 365 days. We have proof that our planet was at one time a sun, and naturally, all the planets of the constellation were then circling around it. While our planet was in that condition, all of its components was evaporated into gaseous matter. These accumulated, around its solar flames, in the same fashion as the evaporated matter now accumulates about the flames of the present sun. Although invisible, this gas may extend many million miles. When the sun becomes saturated and cannot assimilate any more upon the elements of space, and as the equilibrium becomes reestablished, it loses its affinity for the elements of combustion, and its power of creating and communicating the force of differential

density of light passes away. The flames then become extinguished and the whole mass is in total darkness. This huge round mass of hot incandescent, evaporated matter becomes, then, the beginning of a new comet, which moves swiftly into space by reason of the force of the differential density of its heat, brought about by the cold surroundings, in the same manner as the cold drop of water gliding from a hot stove. This new round comet remains invisible until sufficient of this hot evaporated mass has condensed into the liquid or semi-solid state to form its center nucleus. All comets present most remarkable proof in support of this theory, by appearing to possess an appendage called the "comet's tail." We know that all other heavenly bodies have round forms, and we should naturally take it for granted that the comets must have a similar shape also. However, as they are all composed of the evaporated matter of a burned out sun, and because of the superior luminosity of the solar images, this hot evaporated substance is invisible to all, except at the widening strip which is shaded from the sun by the nucleus itself and where the incandescence appears luminous. The candle flame, the luminosity of which cannot be seen in full day light, but which becomes luminous in the dark, furnishes an excellent object lesson of this phenomenon. This theory is given proof by the fact that the appendages of all comets are turned invariably in the opposite direction from the sun light, so that it is in the shadow the incandescent mass can appear luminous. For the same reason, when the comet passes between the earth and the sun, this shadow cannot be seen and the comet appears to have lost its tail. It supplies also the reason why the tail of a comet can assume so many forms. This depends entirely upon the shadow and its action with the gaseous matter. A comet, passing where two luminaries could each cast a shadow, would appear to possess two tails. If there were no star or sun to blind the mass of the whole comet from view, it would then appear like a huge ball of incandescent haze with a bright spot at the center.

When this comet has encircled space sufficiently, and becomes cooled down to the density of a well-regulated planet, it takes its position, according to its density, among the other planets of its constellation. Thus by further cooling, this same mass of matter which was once a sun, becomes a planet which will assume in time, all of the forms, positions and peculiarities which every planet undergoes, until it is again reduced, in the course of centuries, to the small decrepit condition which fits it to become renovated by fire, to new life. The accomplishment of this rotation of life and death by a single planet, requires many billions of years. When we consider that every one of the eight planets of the constellation must undergo these changes and, that even some of them have gone through this ordeal several times, it must impress the mind that the earth and all of the planets will continue to exist practically forever. And so it is with everything which belongs to them.

It is true that all of the planets do not perform this complete transformation in an equally stated time. Some planets do this work comparatively faster than others. This is due to the fact that some furnish more of the hydrogen element toward the solar combustion than others, and in this way become more quickly reduced to the required condition for the renovating.

The time, required for one planet to do the round of metamorphosis, depends principally upon the quantity of hydrogen it has freed by decomposition, at the death and dissolution of its animal and vegetable life. This is the only manner by which the oxygen of

the air and the hydrogen of space can be renewed. The hydrogen, on account of its lightness (being fourteen times lighter than air), when free, rises above the atmosphere to form the gaseous body of space and it is evidently the gas which separates the stars and the planets. It is upon this gas that the sun draws to feed its combustion, and in this way creates the force of differential density recognized as sun light. In a similar manner all combustions on earth draw upon the oxygen of the air to produce the same force of differential density which is recognized as light.

The hydrogen which was a constituent of a vegetable or animal body, when disengaged by decomposition, finds its way above our atmosphere, whence it may be returned as water, in the form of rain, when it becomes combined with the oxygen of the atmosphere, or it may be assimilated in the combustion at the sun and in that manner become the constituent of a future new comet and later on, of a new planet. As the sun draws upon the hydrogen which is derived from every planet, it may be said that the very water on our planet may be composed of hydrogen derived from the dissolution of life from any other planet. Water, being 90 per cent of the animal body and its hydrogen element being 60 per cent, it may have been a part of other planets before it became part of our body, since its perpetuation is due to this provision of renovation.

When the inert hydrogen leaves the earth, stimulated by the vacuum drawing energy at the sun, it creates the force of differential density of light. This shows that the elementary constituents of the animal bodies travel from the planets to the stars. When the stars again become planets, this is again withdrawn by the reigning sun and in this manner the inert material entity becomes perpetuated forever.

This reveals the usefulness of animal life upon the planets.

One grain of hydrogen yields more than 34,000 heat units, for hydrogen has the greatest heating power of any known substance. It is with this heating power that a worn-out heavy planet can be transformed first into a luminous sun, then into a comet, and finally into a light large new planet. All of this indicates that even the matter of which the planets are composed, has always existed. This matter may be evaporated, made into liquid, solidified, turned from one compound into another or form part of one planet and then of another, and no matter what shape it assumes, it continues indestructible and must remain part of the constellation. For this reason it will exist forever.

The elements and matter of all planets, being inert, cannot move, become a liquid, solidify, evaporate, move from one planet to another, live, grow, die or change themselves in any form whatsoever, except by the agency of the force of differential density.

A candle flame could not support combustion, unless the tallow were heated and evaporated by the force of differential density of heat, nor could it give out its own image, if it did not create a force of differential density by withdrawing the oxygen of the air, which by the same force is conveyed further as the force of differential density, and finally recognized as light.

The oxygen and the solid tallow are here chemically transformed into carbonic acid gas and vapor of water, all of which is indestructible and remains on the planet.

The sun would not burn unless its solid matter were first evaporated by heat, and then combined with the hydrogen of space. This hydrogen must enter first and cross through the flame, where it is heated to 500 degrees before it is fit to become part of the combustive combination. When the matter of the sun is united with the hydrogen

gas, it forms a lighter and much expended invisible new gaseous compound which remains as indestructible as before the combustion took place, and which accumulates around the solar flames. By this process of feeding upon the hydrogen of space, the sun increases in size and in levity and, by the force of heat, is transformed from a small, heavy, dense and worn out planet, into a larger, gaseous and evaporated invisible light world. It commences its career as a comet which has gained in the operation all of the hydrogen gas it had lost from the time it was preyed upon by the sun when a planet. The operation is nothing more than a renovating process, which insures eternal existence to the celestial bodies, as well as to their constituents.

One proof of this theory is established by the fact that every time a planet goes through this evolution, it leaves a residue of combustion in the form of a satellite, all the matter of which still belongs to and is inseparable from that certain planet from which it originated. However, because the residue was not evaporated with the rest at the time, it can never recombine with the body of the future planet and is therefore seen floating on the outside in the strata of density in equilibrium with the density it presents as a whole.

The moon, with its mountains and riverbeds washed by fire, is a visible proof that it was left as residue of combustion, at the time our planet was a sun. This is further proved by the fact that when some fragments, called aerolites, become detached, they fall back upon the earth. They show positively by their structure that the moon formed part of the melted bed of an extinguished sun. The fact alone that the aerolite falls back upon the earth would suggest that the moon's matter originally belonged to and is part of the earth, and that although it is in equilibrium as a whole where its present position is, yet this is not true in so far as the pieces, which become detached and fall upon our planet, are concerned.

Our satellite, therefore, furnishes us with the proof that our planet was once a luminous star, and teaches us, further, that Saturn, with its eight moons, has been a luminary eight times. Jupiter and Uranus have each assumed this condition four times, while Mars, having no satellite, is a planet still in the original state and has not as yet passed through the solar evolution. The inhabitants of Mars, who are on a planet half the size of ours, certainly must have had earlier knowledge about this force of differential density than we have, since it appears they have been able with it, to protect their planet from the heavy weight of old age, and have it preserved as yet in the virgin state. The same should be done to save ours.

Mars is situated 48,000,000 miles further than we are from these ravageous influences of the sun which cause so much disastrous havoc upon our planet. It therefore has no such storms, tornadoes or earthquakes as we have, no such excess of heat and cold, and its people must certainly wear a broad smile when they see our planet in the grasp of an electrical storm which, when the lightning flashes, makes our planet loom up in space, with tongues of fire, like the beginning of a new luminary. We are by this means given the evidence of how our planet will be transformed into a luminary when this lightning becomes continual.

Just now the phenomenon is only a warning. The inhabitants of our planet may either let it go at that or take measures to retard the inevitable end. It, however, shows fairly well, that when these flashes become continual, our planet will metamorphose into a star. Lightning is nothing else than the hydrogen gas derived from our planet which, by accumulating in the space above, creates the force of differential

density which causes it to return to re-establish an equilibrium. When this gas pierces through the atmosphere, some of it enters in combination with the oxygen and forms rain, while that which comes in contact with the earth starts fire and combustion. It would, without doubt, create a general combustion were the earth less protected from it by its own atmospheric air (composed of oxygen and nitrogen gas).

Not only do the sun, comets and planets change form and position in the perpetuation of the various worlds, but everything upon them undergoes continual changes. The gigantic vegetation and big trees, which used to grow on our planet, are nowhere now to be seen on the face of the earth. They are buried by the caving beneath the earth and form the substance of our coal supply. The colossal mastodon and the animals of the antediluvian world have all passed away long ago. Even the caloric of the poles, where the luxuriant vegetation used to grow and upon which those animals grazed, is now extinct in the solidly frozen desolation. The largest animals of the present age are quickly becoming wiped out. The earth of today is, in many respects, in a different condition from what it was 5,000 to 10,000 years ago. The present human generation, represented by 1,500,000,000 inhabitants, will in a few years change and make room for others. Not even half of those alive today will exist in 40 years from now. It has been estimated that over three million deaths occur a year.

When one is born he draws upon the general store of oxygen. This is continued until he passes away. This process produces the carbonic gas which is used to nourish vegetation and is provided to fit this requirement. It could not be expected that the lung power of the animals, at present occupying the earth, could produce as much of this carbonic gas to aid the life of the luxuriant vegetation, as was furnished by the gigantic antediluvian animals, with their powerful lungs and enormous proportions. During that period of time the earth was also much larger. The earth has since shrunk considerably and what grows upon it is now much smaller. The larger animals and vegetation disappear to make room for the smaller, and in this way everything changes and moves constantly.

All this proves our deduction regarding the everlasting of worlds and the matter upon them. Inert matter, being indestructible, always has and will exist forever. The changes made are all due to the energy creating the force of differential density, manifested by light, heat, magnetism, electricity, life, motion and sound, all of which are but a change of density and condition in matter. This force is only felt upon the nerves by the differential density it produces upon them. It may cause chemical changes, as in the case of light, molecular changes as in the case of heat, or bodily motion in the case of visible or invisible matter, as in sound, still nothing is lost of the inert matter; every atom remains to be used and reused forever.

Some of the early colossal vegetation has since become and is now seen as coal, while other portions of the same vegetation have decomposed and formed the soil. Many billions of animals have been born, lived and died upon our planet and of which we never will know anything. Some of these fed upon vegetable matter and others upon animals, yet none has taken as much even as an atom of matter away. After dissolution, all have returned their chemical constituents to the planet, and it is through this foresight of nature that life is yet possible upon the earth. The very inert elements used and reused, many million times, over and over again, form today every part and the body of our atmosphere, the oceans, vegetable and animal matter, and are the same which will be used again and again for all time to come.

Formation of Water.

THE energy which produces the force of differential density, being foreign to all matter, can disintegrate anything, although it produces only a temporary change in that way. When the animal body, which is composed of 90 per cent of water, liberates its components in the form of gases, it does so in this way. One atom of oxygen returns to mix with the atmosphere, while two atoms of hydrogen rise above it (hydrogen being 14 times lighter than air). This hydrogen cannot sink into the denser strata, except when it becomes chemically combined, at a high and rarefied latitude, with free oxygen. This combination, after expanding through rarefication, forms the component of water which is then used again, in this condition, by the vegetable and animal life. This agrees correctly with the fact that oxygen and hydrogen gases, when in contact and through the expansion of the molecules, either by the force of heat or that of rarefication, will unite chemically to form the compound of water. It also proves that, when nitrogen becomes substracted by the lower vegetation, it promotes the formation and subsequent fall of rain. Free oxygen, being slightly more dense than the nitrogen of the air, would not come in contact with the free hydrogen of space unless this nitrogen were substracted below by the vegetation, thus leaving the oxygen in free state above. We thus observe that rain is another phenomenon due to the force of differential density in these elements.

Lightning.

IT IS also the force of differential density which causes the phenomena of lightning and thunder. This activity is due to the loss of hydrogen, which undoes the chemical equilibrium of the planet, as it is withdrawn by the sun's energy and becomes lost to the main body of the earth. The differential density thus produced creates the atomic attraction called chemical affinity. This is nothing else than the same force of differential density by virtue of which the hydrogen gases pierce their way back through the isolating atmospheric envelope in the effort to re-establish the undone equilibrium. At present, comparatively small quantities of this gas are able to force their way through the protective envelope. However, in proportion to the increase of this force and the decrease of the protective gases in thickness, so the possibility of our planet changing into a sun will increase. The earth will finally be metamorphosed into a luminary by this same force of differential density which is being continually intensified by the withdrawal of hydrogen and which is the force which is doing all of nature's work, and which acts at the sun. Even now, when lightning strikes, the hydrogen does not show as if it crossed many miles from above.

However, when the planet becomes a sun, it will, by recuperation, recover and reassimilate all the hydrogen it has lost and start upon a new cycle in the same way as it has done millions of years in the past.

There is no doubt that these flashes of lightning show in every respect similarity to the sun's flame. They produce light, fire, heat and sound, and are visible from all the planets because they withdraw hydrogen from space and, as the sun does, convey the force of differential density to the optical nerves of those living on other planets, by the same method as the force of differential density of sun light is conveyed to ours. It is by these means that our astronomers are able to detect the changes occurring in other stars.

Sun Light.

WHEN comparing the action of the candle light with that of sun light, a similarity is made at once apparent by the fact that the sun's image is reproduced upon the earth in all directions and that it must be segregated from the confusion to become visible, just as was done with the candle light by means of a lens.

So, also, the confusion of the sun's image produces the same phenomenon of light as in the case of the candle light.

We have learned that the force of differential density, produced by candle light when withdrawing oxygen, can lift 6 ounces of water in 10 seconds, or two tons of water per day. The sun, in drawing upon the hydrogen of space, creates a much more powerful force of differential density. We shall now investigate this force.

What is the Cause of Cold and Heat upon the Planet?

THE means of arriving at some explanation as to why extreme cold reigns at the poles and excessive heat exists at the tropics, has always been somewhat of a mystery to science. Although the sun is 91,430,000 miles away from the center of the circumference of the globe, yet at a distance of only 3,500 miles further, we find the temperature at the poles 50 degrees below zero. On the other hand, we have 100 degrees of heat, in the shade, at the tropics. This alone should have inspired the idea that caloric does not reach the earth in the way suggested. This is substantiated by the fact that on the top of high mountains, which are practically 30,000 feet closer to the sun than the plains, across which this caloric is supposed to pass, we find cold latitudes and perpetual snow.

We know the sun illuminates one-half of the planet at a time, each of the poles receiving the sun's image six months continually. As the earth must appear like a very small ball when seen from the distance of the sun, it would be impossible that it could pick out any particular spot with reference to the degree of heat to be applied, in the manner experienced upon the planet, irrespective of any spot it illuminates. The cold at the poles and heat at the equator are the result of the feeding of the sun's flames upon the hydrogen of space. When this gas is withdrawn and becomes consummated in the combustion, it leaves a vacuum, which is the force of differential density which is forwarded with the force of light. When this reaches the outer layer of our atmosphere (composed of oxygen and nitrogen), which cannot be used in the sun's combustion, it sucks the atmosphere into the vacuum mechanically, in the same manner as when the water was raised in the vacuum, in our Experiment 7, Fig. 4. In this way the center of heat of our planet is displaced from the correct center to a point nearer the surface in the direction of the sun. The atmosphere

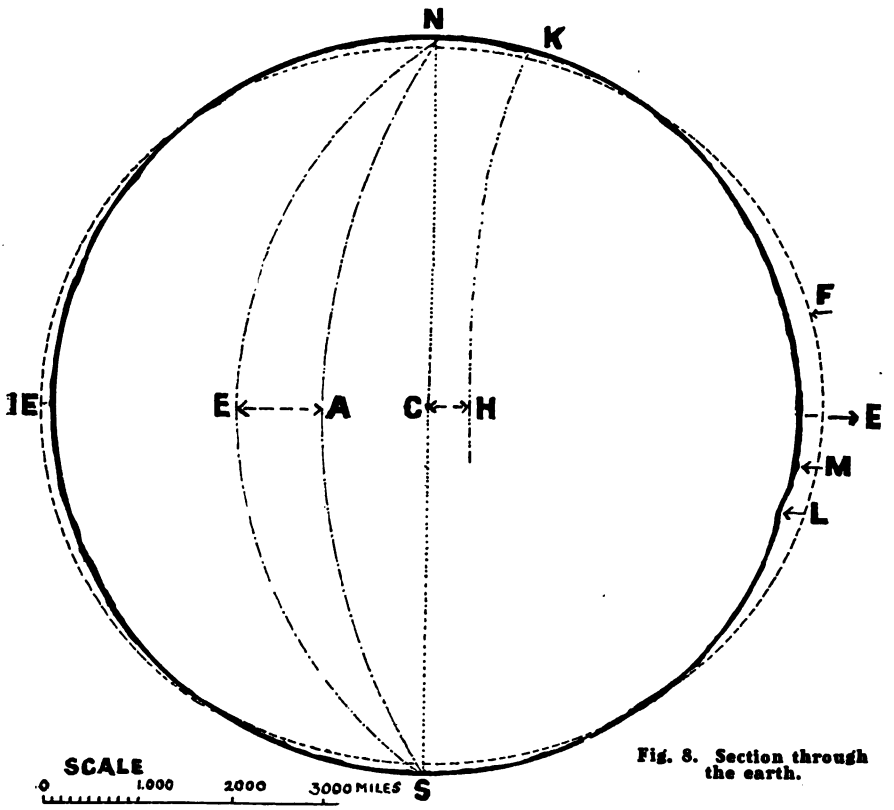


Fig. 8. Section through the earth.

A. to E. Shows distance traveled by the earth's rotation in one hour, being 1042 miles at the equator.

C. Center of the earth which becomes shifted by the drawing force of the sun from C to H.

E. Side exposed towards the sun.
I E to E Equator line.
Circumference of the earth is 250,000 miles.
The dark line shows the thickness of the earth's crust of 28 miles.

F. Dotted line shows the bulging of the atmospheric envelope.
This contracts at the North and South Poles. E. shows the large atmospheric bulging at day and I E the lowering or contraction at night.

N. North Pole.

S. South Pole.

M. Shows the highest projecting mountain, the "Everett", 29,000 feet.

L. Shows the lowest depression in the Pacific Ocean of 30,000 feet.

K. Shows point of magnetic declination at the Pole.
Diameter from North to South Pole 7898 miles.
Diameter through Equator 7926 miles.

Temperature of the Earth:
at 2 miles down 212 degrees Farenheit.
" 7½ " " 750 degrees Temperature of red hot iron,
at 18 miles down 1850 degrees Temperature of melted glass,
at 28 miles down 2700 degrees Temperature everything in melted state.

thereby assumes an elliptic form, as is shown by Fig. 8, bulging out at the equator, where the relaxation of pressure is acting, and contracting at the poles. In consequence of the bulging of the atmosphere to one side, the center caloric becomes displaced toward the sun and produces the excessive summer heat at the particular locality. This also explains how, at night, this same heat, together with the receding of the atmosphere into the earth, as it is drawn out at other localities, produces the cold of night. This is due to the fact that the surface of earth comes in contact then with the upper cold strata of air. It is a wise provision of nature, for it purifies the air every twenty-four hours, by filtering it through the soil and the oceans, and thus provides the refreshing atmosphere of the morning. The molecular expansion of the force of heat remains latent in the inert matter in contact, due to its slow motion, and thereby prevents, in summer, the complete cooling to freezing point at night, as the caloric recedes back into the bowels of the earth.

Heat.

THIS illustrates also, how nature still manages to heat part of the earth and its atmosphere and provides the necessary caloric to the vegetable and animal life. The present available heat of the earth is far below its requirement. It is insufficient to provide a comfortable temperature upon the whole outer surface of the globe and, for that reason, we find that while some localities are heated very effectively, the rest remain frozen and cold. Heat must now be distributed (to make it reach around) alternately, first to the northern hemisphere and then to the southern, producing in that manner our summer, spring, winter and fall. On the other hand, where this center heat never reaches, we find perpetually frozen ice and snow, as at the poles and upon high mountains. All planets are half exposed towards the sun and (except for the clouds) receive the image of the sun equally upon their entire exposed half. If heat crossed space in the same manner as light, this one-half would be heated as thoroughly as it is lighted. Wherever the sun's image appears upon the earth it produces day light. However, heat is not felt at all of the localities which are lighted. Heat, being a molecular resistance, is too slow moving, and cannot cross space to warm the planet. Before it could heat our atmosphere, it would have to expand every molecule of gas in the 91,430,000 miles of space which separates us from the luminary. This would be necessary to enable it to produce therein the molecular differential density of heat. This is all the more impossible in that this gas is the poorest conductor of heat known. It is true that when exposed to the sun's light, one feels a sensation of heat creeping into his being. This is not due to any of the sun's caloric crossing space, for only the chemical force of light and the mechanical force of sound can cross space. It is due, however, to the expansion of the molecules of the matter composing the skin by which the light force is transformed into that of heat.

The heat from this conversion is not lasting. It is only a local change. When you step from the sunlight into the shade on a cold day, you will feel the difference immediately. Furthermore, the sun could no more heat the planets by expanding the molecules of matter and at the same time produce the force of differential density of light by withdrawing hydrogen gas, than the candle light could, by withdrawing oxygen from the air, increase its density. Light and heat are two forces with opposite results. Light withdraws certain elements, thereby producing a vacuum. It cools, moves, shrinks and rarefies by diminishing the quantity of matter, while heat expands the molecules of matter, thereby increasing the volume to a larger space without adding or diminishing the quantities. If heat could cross space, it would annul the force of differential density of light. The expansion would be annulled by the vacuum. If, in Experiment 7, Fig. 4, the heat from the candle's combustion had been able to keep the molecules of nitrogen in the expansion state, the water could never have risen into the vacuum of the force of light and would not have been transmitted to be transformed into motion at the water.

Our planet is warmed by its own caloric, or rather by the heat density which has remained at the center of the earth since it was evolved from the star state. This is carried to the surface and into the atmosphere by the mechanical action of the force derived from the activity at the sun's flame. This force crosses space with the force

of light and is reconstructed into the mechanical force of motion, at the outer atmospheric envelope of our planet. The chemical force of light, however, continues its course through the atmosphere and reaches the liquid and solid matter of the earth.

Chemical and Mechanical Forces.

TWO distinct forces reach our planet from the sun; one is the mechanical force, derived from the roaring sound at the solar combustion, and produces all the mechanical motions observed around us, such as the rotation of the planets, the bulging of the earth at the equator and the shifting of the central heat. It produces the seasons, the heat of day and cold of night, and purifies the atmospheric air, causing it to move from a gentle breeze to the speed of hurricane. It creates tornadoes, causes the tides and produces the ocean waves, earthquakes, landslides and volcanic eruptions and magnetizes the poles. All of this is purely mechanical motion. This does not decrease the volume of one thing by adding it chemically into another, but simply moves matter about. While the results of sun light are always chemical operations, the hydrogen is withdrawn by the sun light, as the oxygen is by the candle light. The hydrogen combines chemically at the sun, just as the oxygen combines chemically at the candle flames. Both form new compounds and are purely chemical operations. The combination of the oxygen with hydrogen in rain, is a chemical operation. In the case of electric storms, several chemical operations take place. In the reducing of the bulk of the earth by withdrawing hydrogen, a whole series of chemical operations occur. By the life, growth and death of mineral, animal and vegetable life, in this way, we find that the same force of differential density can produce not only mechanical motion, sound, but also the chemical operation of light and the molecular expansion of heat.

Therefore, if light, which is a chemical action, can induce molecular expansion, heat will result. If sound, or motion, which is a mechanical product, can induce chemical action, light will result, while if motion can induce molecular action, (as by compression), then heat will result. If heat, which is a molecular resistance, produces chemical reaction, light will result, while the same mechanically applied will produce sound or motion.

Bulging of the Earth at the Equator.

THE bulging of the earth at the Equator is another result of the relaxation of outward pressure. When the sun withdraws the hydrogen of space, the inner density, pressing outwardly, pushes and holds the outer crust into the relaxation, with the result that the earth has become an oblate spheroid, having a difference in length, between the diameter at the poles and that of the Equator, of 26 5/11 miles. This is a phenomenon which may be compared to the scattering of a window pane on the outside of a building when a big explosion occurs. The relaxation of outside pressure, being the force of differential density of sound, permits the inner air to expand into the relaxation and carries the glass with it. In the same manner, the earth is held forced into the relaxation produced by the force of sound at the sun, and thus the equatorial bulging is formed.

This phenomenon has been attributed erroneously to centrifugal force. This applies well enough to the swift revolving of a grindstone or that of a wheel from which water and mud can be thrown when many revolutions are made a second, but it cannot be the factor which

lifts millions of tons of earthly matter. This is particularly true when we know that one revolution in 24 hours does not even lift or displace a single grain of sand. As for the explanation that the earth acquired that form, when it was in a semi-molten state, we have the fact that the earth is caving in continually and that it is not to-day in the shape it was then. This caving in is still going on and is felt as earthquakes. Fig. 8 shows how much space the earth moves in, in an hour.

Motion of the Earth.

THE rotary motion of the planet is another phenomenon which can be attributed to the force of differential density. It results from the same relaxation of pressure which is due to the vacuum produced by withdrawing hydrogen from space. When the center of heat, which is also the center of density, is moved toward the sun, it increases the density and weight in the exposed portion of the crust and thereby causes the motion from west to east, upon the elliptic plane. This produces the rotary movement of the earth, causing it to revolve every 24 hours and to encircle the sun every 365 days. All planets rotate from west to east and are influenced by the same excess of density caused by the force of differential density of sun light. It acts upon all alike, but in different intensity in proportion to the distance. Our satellite, (the moon), has no such rotary motion because it has no central density to displace. That is why the heavier portion of the moon always hangs toward the earth. The sun light upon the moon surface can only produce thereon the molecular expansion force of heat which expands the inner gas and gives it the levity which allows it to float in the strata of equal density.

Magnetism at the Poles.

THAT fact that the earth makes one revolution, every 24 hours, does not imply that the entire matter of the planet revolves as a solid body. This would be impossible. We know that at a depth of 28 miles everything is in fusion. This liquid mass cannot follow the rotary movement of the outer shell any more than water contained in a drinking glass could move with the glass, if it were simply turned once around in 24 hours. If this experiment is tried, we will observe that the liquid and molecules in contact with the glass by virtue of the inertia, will not move, but will rather oppose the motion, and in so doing, create a frictional resistance. This resistance between the motion of the solid shell of the earth and the inertia of the molten mass produces a friction at the rate of 1042 miles per hour at the equator, that electrifies the earth and produces the polar magnetism. This is furthermore corroborated by the fact that the magnetic needle never points to the true north of the earth, but to a point corresponding to the declination, sustained from the shifting of the center line of density as already explained, and which displaces the caloric and the density, or weight which causes the planets to revolve on their axes.

Motion in the Atmosphere.

THE motion of the atmospheric air, in the form of the trade winds, wind storms and tornadoes, results from the effort of the atmospheric air to re-establish the equilibrium which is being continually disturbed by the drawing force of the sunlight and the rotary motion of the earth on its axis, and which is a consequence of the irregularity between high lands and mountains and the lowlands at sea level. The column of air which is sufficient upon high places to be in equilibrium, becomes insufficient as it passes to

lower level, because of the rotation of the earth. As the gaseous atmosphere is movable and is influenced by density and weight like the liquid and solid earth's crust, the air being movable does not follow the motion, and therefore must rush from place to place to fill the discrepancy in the height. When this takes place at the same hour every day, as it is experienced at certain localities and during certain seasons, it produces what is known as the trade or periodical winds. The relaxation of pressure acts half the year on the northern hemisphere and the other half on the southern hemisphere, due to the yearly movement of the earth about the sun. These two movements produce, at times, such suction upon the atmospheric air, that in order to re-establish the equilibrium, the air must rush forth with such velocity that it attains the swiftness of the hurricane and wind storm.

The Tides.

THE tides furnish another illustration of motion derived from this same relaxation of pressure. It causes the oceans to bulge out into the same relaxation of pressure from light, as do the earth and its atmosphere. This action upon the fluid matter permits it to return to the equilibrated state, like the air, as soon as the relaxation is past and acts elsewhere. The lifting of the ocean forms the tides. This movement would actually occur every 24 hours, but for the inertia of motion of the water as the result of which about two hours per day are lost, before the tide is able to follow again into this relaxation. Nevertheless, other independent waves are caused which, when greatly animated by the swift shifting and changes of the atmospheric pressure, bring about rough seas, storms, etc.

Mechanical Motions.

THE rotation of the earth. The bulging at the equator, the shifting of the central heat, the purging of the air by passing it through the earth, the trade winds, wind storms, ocean and tidal waves, and the magnetic condition of the earth are all direct motions derived from the force of differential density of the sound force at the sun. We do not hear this force except when the motion reproduces again the conditions peculiar to sound, as that which occurs in the case of the ocean waves, the wind storms, etc. In all the above phenomena, there is no chemical reaction representing light, nor are there any molecular changes representing heat. There is only the force of differential density of motion, the same force which causes heavy bodies to fall or lighter ones to rise, and which sets the ear drum in action when sound is heard.

Chemical Forces.

THE phenomena due to light have chemical reactions which change the constituents of matter by substracting the hydrogen of the space of the planets and incorporating it into the solar combustion. Both of these are chemical acts. The candle flame changes the composition of air by withdrawing the oxygen which is converted into other combinations, all of which are chemical actions.

So the sun changes its components by assimilating the hydrogen of space which is derived from the planets; its matter becomes evaporated to a larger size by the change in the combination; all of these are chemical actions. The shrinking of the planets, their reduction in bulk, their cooling and changing in weight and density, all culminate from a long series of chemical operations. By means of these chemical changes, vegetation is transformed into animal matter, and vice versa;

finally, their chemical constituents are freed by decomposition, the hydrogen rising above the atmosphere to be reused and the oxygen remaining in the atmosphere to also once more be reused. The loss of hydrogen, released through the dissolution of animal matter, imperceptibly diminishes the bulk of the earth and reduces its caloric which, by shrinking, causes the earth's crust to cave, thus producing the earthquakes. The surplus of the under caving is then rejected and volcanic eruptions result. Both the earthquakes and volcanic eruptions are intended to adjust the differential density, with the object of re-establishing the equilibrium which was undone by the chemical action of light.

The sun can produce many other chemical reactions; it bleaches and discolors most substances exposed to its light, and it does the work upon the chemicals of the photographic plate, blue prints and other similar objects.

Feeding the Flames.

IN addition to all of the proofs that the sun's flames produce actions similar to those of the candle flame and that both must undo the state of equilibrium, recognized as light, we have the fact that both must feed and therefore be surrounded by the gaseous ele-

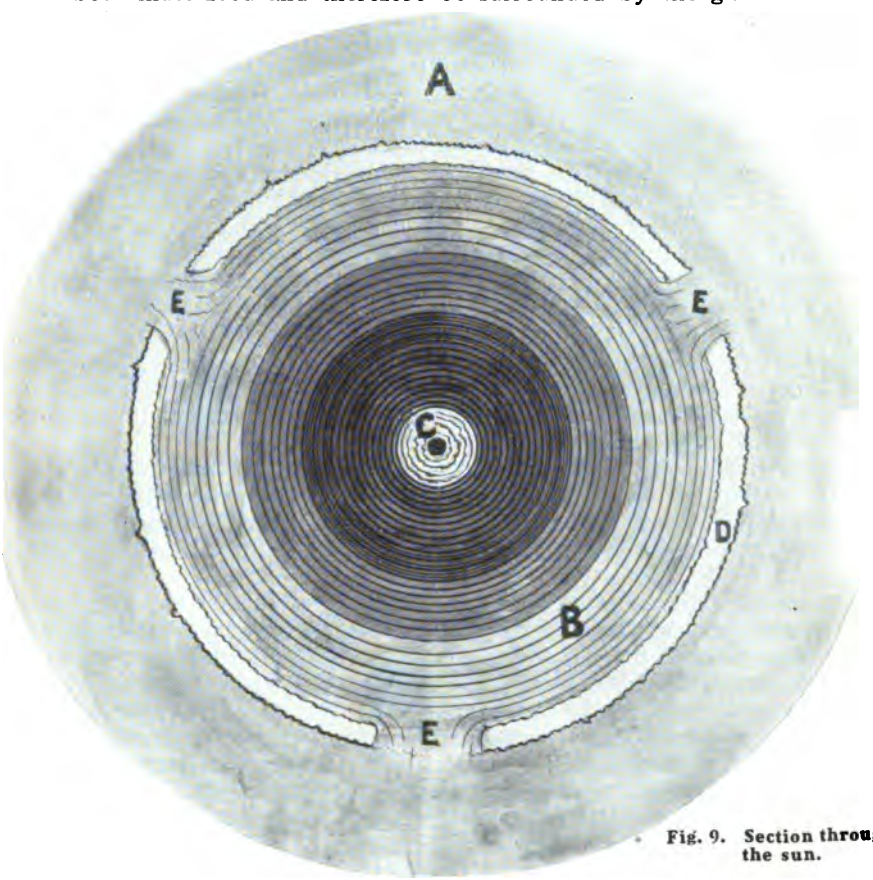


Fig. 9. Section through the sun.

A. Invisible incandescent evaporated mass, invisible but millions of miles thick.
B. Space where the inert matter combines chemically before producing the flame.
C. Center core of which the outside layers are melted away and then becomes evaporated. Between C and B is the dark space where the vaporated matter combines with the Hydrogen entering at opening E from outside space.
D. Flame of the sun 40,000 miles thick.
E. Dark spots seen on sun where the Hydrogen enters from space.

ments needed in the combustion. We have observed that oxygen must be provided and be fed continually to the candle flame. It enters at the dark space seen below the flame and, combining with the evaporated tallow through a chemical union, produces the flame. The same thing occurs at the sun. The hydrogen of space, which surrounds the sun, enters below the flames to unite chemically with the evaporated substance which is procured from the center core. These two unite and, burning together, produce the sun's flame. Below the sun's flames exists a dark space, like the one visible under the candle flame, which is visible where the hydrogen forces its entrance through the luminous flames, casting them aside and then presenting to view the phenomenal dark space called the "Sun's Spots," as shown by Fig. 9.

The flame itself, whether it be that of the candle or that of the sun, cannot unite with any elements, because it is the result of combustion which is the end of the chemical action. Both produce chemical results that remain. The result of the candle flame finds its place in the atmosphere, while that of the sun remains evaporated and invisible and surrounds its luminous body. It is the part of the sun which will form the body of the future comet and later on the future planet.

Incandescent Light.

WE can now proceed to analyze other methods by which the force of differential density of light is produced. One of these agencies is the incandescent light which is produced by means of the passing of electricity through a carbon or tungsten filament which is heated to a white heat. Another is the arc light in which case the current passes through air and becomes luminous, or on the other hand, heats some metal to whiteness like the iron in the forge. All this is the same light and can reproduce its image in all directions. It is by the confusion of these images that the phenomenon of light is produced. These methods of producing light should be classed as secondary results. This is not light obtained directly from energy, as from the heat of burning matter which withdraws the oxygen from the air or hydrogen from the space. These are simply transformations wherein the energy is utilized to produce the force of motion or heat first and where light results only from a subsequent transformation of the same force.

It may be stated here that this force of nature once created, is also indestructible. It will travel and may be transformed from one result into another. It may linger at matter for centuries, but it is sure to do its work in the end, and until every portion of the force is neutralized.

An example of transformation can be illustrated by the telephone. Here the mechanical vibrating motion of sound produces a relaxation of pressure upon the disk or diaphragm of soft iron at the transmitter and induces a differential density in the magnetism of the magnet which is placed directly closely behind this iron disk; this change in density is taken up by the fine isolated copper wire and therein multiplied by reason of the number of coils into which the wire is wound, inducing thereby a current of electricity. As the current goes through the wire, it conveys the same differential density of electricity which is then transformed into magnetism at the magnet of the receiving station. This imparts a corresponding motion to the receiving disk, which then reproduces the same mechanical movement and vibrations as was originally imparted to the speaking disk. In this manner the identical differential density of sound is reproduced in the air and upon the ear drum.

Thus we have an illustration of many transformations; first, from sound into motion, then into magnetism, then into an electric current, then again into magnetism and finally into the mechanical vibrating motion of sound which, when received upon the ear drum, reproduces the original words and sound perfectly with the proper pitch and timber. After the speaker has furnished the energy which has produced the force of sound, the other phenomena are simply transformations of the same force.

The same thing occurs in the case of the electric light. The necessary energy can be derived from steam, gas engines, water turbines, or from muscular action, when any one of these is used to rotate a dynamo. The resistance to this motion is manifested by the force which becomes apparent in the magnetism of the soft iron. This induces a resistance into the insulated copper wire wound around it and is recognized as the electric current. When this current encounters the carbon or tungsten filament, the molecular resistance to this current produces heat, and when this is heated to whiteness, we have light.

This light does not require oxygen or hydrogen as a factor to produce chemical energy. The energy is provided by the power which produces the motion and which is provided by the steam, oil or water which runs the dynamo. This undoes the state of equilibrium in the soft iron and the resistance to this motion is manifested by the force of differential density in the magnetism which, by virtue of this force, draws upon the iron, induces it to move and be magnetized. It also draws, by this same force, upon the insulated copper wire wound around the iron core and, as it cannot induce magnetism in the copper, the drawing force is resisted by the manifestation of an electric current passing through the wire. When this current encounters molecular resistance, this same force of differential density, which was motion, next magnetism and then electricity, is transformed into heat. When it becomes white hot, the same force of differential density becomes possessed of all the chemical properties peculiar to light. It can then reproduce its own image which, by the confusion created, produces the effect of light. It can act chemically upon photo plates, blue prints and silver prints and bleaches and does all the work candle light and solar light can perform.

In experiments 10, 11 and 12, it has been clearly demonstrated that objects move only by virtue of the force of differential density, in the effort to re-establish an equilibrium; therefore, if anything at rest is forcibly set in motion, the reverse action takes place, and the state of equilibrium becomes undone, thereby creating the force of differential density.

Once this force is created, it can be collected upon isolated wires as electricity and wound around a soft iron core, in an arrangement like that of a dynamo where the electricity can be intensified, and the force of differential density of motion can be transformed into magnetism, electricity, heat and light.

Once the force of differential density of light created, by means of withdrawing oxygen or hydrogen, it can be converted by the same force into the secondary light effect or images, that needs no oxygen or hydrogen, and even into any other secondary result as illustrated by those produced from the force of differential density of sound where the force is converted into motion, magnetism, electricity and back into magnetism, motion and sound, as it occurs at the telephone, or like at the dynamo where the heat force producing motion is converted into magnetism, electricity, heat and light, these are all secondary results, derived from the primitive force.

In Experiments 2, 3, 4 and 5, where the image is seen projected upon the wall, ceiling and floor in the inverted position, those images of the flame present the secondary results of the force of light. The original force of differential density produced by withdrawing oxygen or hydrogen cannot cross a solid substance, not even glass. This was demonstrated by Experiment 7, wherein the force of differential density spends its force (converted into motion) by lifting the water, because it could not cross the solid glass.

In the first experiments referred to, the image becomes segregated from the confusion by the convexity of the glass lens, and appears further only by virtue of the primary force of differential density without drawing upon oxygen. This is a conversion from light that requires oxygen into light, like the electric kind that needs no oxygen.

This light can still further reproduce its image or confusion of images called light as long as the force of differential density continues.

All of which goes to show that the forces of motion, light, heat, electricity, magnetism, sound, life and the rest of them, are but one and the same force of differential density. It cannot be incorporated into matter, but acts accordingly, as the energy is employed in undoing the state of equilibrium, whether chemically, molecularly or mechanically, when it will produce light, heat or sound. Once the force is created it is indestructible. It will do the work and can be transformed from one result into another, provided the proper conditions are present, and the force of differential density still exists. In which case each result will present and possess all the peculiarities by which the particular result is recognized.

The moon light is also a secondary powerful source of illumination. The sun reproduces its image upon the exposed surface of the moon; the moon in turn reproduces its image upon the earth, while the confusion of the sun's image produces the light effect upon the moon. Just as the confusion of the image of the moon produces the moon light effect upon the earth, this illuminated surface can still further reproduce its image and confusions, as long as the force of differential density continues. All these phenomena are the result of resistance to the original chemical energy produced at the sun's combustion. It causes the motion of matter to be toward the sun because it was there that the original equilibrium was undone, and the motion of matter goes in that direction, with the object of re-establishing it. There can be no reflection of light. It is the same force, drawing upon the moon (which can furnish nothing toward the return to equilibrium) which is forwarded to the earth, and produces there the force of differential density called moon light. In the same manner everything illuminated becomes visible by the action of the original energy which, by creating the chemical force of differential density and undoing the equilibrium, creates the negative force which is forwarded until it procures the element which is to re-establish it, and, in this way, reaches upon the sensitive optical nerves.

Nothing leaves the luminary. It is a pull all the way through until the undone equilibrium becomes re-established. The force of differential density, once created, is indestructible and will travel and act until utilized or neutralized.

Light has never been demonstrated as we have described it in this work. To enter further upon a complete treatise of the workings of the force of light, would necessitate a full description and analysis of sound. Both forces, being the same force of differential density, act alike in many respects. In light we have the image, while in sound it is called the timbre. The colors are the pitch, and the intensity in

light is called the loudness in sound. Then we have what we call light proper, which is the confusion of images. In sound this is called noise, which is the confusion of sounds. What light is to the eye, sound is to the ear. Both follow certain rules, which require much explanation and which I cannot enter upon now, for lack of space.[1]

[1] The reader who desires more information regarding the force of differential density of "Sound," can obtain the same from my work entitled "THE ANALYSIS OF SOUND," which is a complete treatise on acoustics. It explains how Pitch, Timbre and Loudness are mechanically produced and received by the hearing organs and conveyed to the brain. How this force can be used mechanically, conveyed and held in a receptacle, a feature not possible with the force as light. This work will be published when a sufficient number of subscribers are secured, and will prove to be of great help in abating deaf-muteness.

Finally.

IN recapitulating, let us sum up the experiments we have made to assist us in discovering what light is. We have found, by Experiment No. 2, that when the image of the flame is thrown upon the wall, by moving the lens in either direction, the picture is reproduced everywhere and the confused condition of the image (See Exp. 3) gives us what we recognize as light.

By Experiments 4, 5 and 6, we find that all such images are not exactly alike, but duplicates of the flame as seen from the particular direction, and that the motion of oxygen is toward the candle, and nothing is started from the light.

In Experiment 8, the force of light reveals itself by lifting water, from which the natural conclusion arises that light is the force of differential density due to the extraction which produces a vacuum of that element, in the invisible air, which, when acting upon the nerves of the eyes is light, but when acting upon water is transformed into visible motion; and that light and motion is not material oxygen or nitrogen, but the invisible imponderable force of differential density existing between the two densities of the air and of the nitrogen left, after the oxygen is substracted. We have here a force which is indestructible, by reason of the fact that it consists of nothing but the unequal condition of matter.

In Experiments 9, 10, 11 and 12, it was demonstrated that it is the same force of differential density which causes all bodies to rise or fall toward equal density, which, when once reached, re-establishes the equilibrium, when the force is at an end.

In Experiments 13 and 14, by reversing the order of natural density, another proof is added to those previously presented, since the same force acts both ways. Here is explained the reason why all inert matter is indestructible and everlasting, and how this force of differential density procures and maintains the oxygen of the air and the hydrogen of space, the elements by which all inert matter acquires the chemical force by which it lives and becomes active. This is not due to the addition or substraction of anything, but to the creation of the force of differential density, which, by the undoing of the equilibrium, calls into existence the force which must restore it. This constitutes the force which draws upon the same element as the one used in the chemical energy at the combustion, and in this way conveys the unestablished state of equilibrium, as the force of differential density, along and to the nerves. The fact that the component parts of the nerves are of the very same elements, makes them sensitive to that specific force.

It is further shown, in Fig. 8, how the sun, by using this same force of differential density, by the conversion of light into motion, heats the earth by simply drawing and moving the central caloric to the surface and into the air which moves to fill up the vacuum created; how this extra density, by its own weight, then causes the rotary movement of the earth's crust; also how, by the resistance of the inertia through the frictional motion of the hot fluid matter of the inner mass against the motion of the solid crust, it magnetizes the poles; and, furthermore, how it causes the bulging at the equator and of the ocean, thereby producing the tides, the atmospheric motion, and all other mechanical movements of inert matter on the planet and its surrounding atmosphere, as is evidenced by the wind storms, earthquakes, volcanic eruptions, etc. All these actions are similar to the raising of the water by the chemical energy at the combustion, whereby a vacuum is produced, through consuming oxygen at the candle flame, as was demonstrated by Exp. 7, and where the same force of differential density is transformed from light into motion.

The force at the sun's combustion also causes other chemical reactions besides light, such as rain, lightning, life, the chemical work on the photographic plates, bleaching, etc., due to the chemical action of the force of differential density upon the inert matter.

So we find that all the phenomena of nature are simply different results accruing from the same force of differential density. This same force, when acting upon inert matter, in one condition creates, by molecular expansion, the force of heat and life, and while in another condition, when not acting upon the molecules, produces the mechanical forces of motion and sound.

So, also, it has been demonstrated that this force, once created, is indestructible, and will transform itself, until consumed into any secondary result in the effort to re-establish equilibrium. In this way the incandescent light is derived from the transformation of motion into magnetism, electricity, heat, and finally light. All are one and the same force of differential density. This force which undoes the state of equilibrium, if once created, will reconstruct that equilibrium, no matter what it must act upon, no matter how far it must travel, and no matter into what result it may be transformed. It can travel enormous distances when in the form of light, electricity and sound and, if it is not utilized, will travel still further, like the moon light. It will even return to the place where it was created, as in the case of the phenomenon of the echo in sound. On the other hand, it may wait until centuries have passed, before it manifests itself in the shape, for instance, of the force which causes landslides, earthquakes, and the falling of rocks from the hillside. It is also the same force which brings back to the earth the aerolites which become detached from the moon.

As a final argument, it has been demonstrated that both the candle flame and the sun's flames must be fed; that all living inert matter must use and transform chemically some inert element into another compound that leaves an unsettled equilibrium, to be able to produce by the energy at the combustion, the force of differential density, which is then light, motion, heat and life. This heat is the life at the sun which, by assimilating the hydrogen gas in the combustion, produces the force of differential density which builds up, by expansion and evaporation, from the same inert matter derived from an old worn-out planet, a new invisible comet which will in the future be a visible world. In the same way the heat force, assimilating oxygen at the candle flame, produces the force of differential density which can

transform a visible tallow candle into invisible carbonic acid gas and water vapor, and in so doing draws upon the element it consumes, it is the same force of heat which, by assimilating oxygen, produces the force of differential density which, by forming a new compound, builds up the animal and vegetable tissues and gives them life. This withdrawal of the inert element used in the combustion, through the undoing of the equilibrium, becomes and represents the positive part of the force. This force is entirely converted into heat and is wholly used up. Because it leaves matter in an unequal state of density, it creates the negative part of the force whose office is to re-establish the equilibrium again. In light this negative part of the force, drawing upon the same element, has to travel until it can find this element and thus convey the force of differential density further until sufficient of the same element is procured to re-establish the equilibrium. In so doing, it reproduces the images of the flame and imparts, by the confused images, the sensation of light when it reaches and acts, as the force of differential density, upon the elements of the visual nerves.

As this withdrawal of the elements also creates a vacuum, it will act upon any other inert matter it cannot use or assimilate, and when free to move it is displaced into the vacuum and becomes manifest as motion. This is how the differential density of the chemical force of light can be transformed into that of motion, and lifts water, and why the sun's light can rotate and heat the earth, bulge the equator, move the ocean and the atmosphere. When this same force acts in expanding the molecules of inert matter (in the combustion) it produces a strain upon them which is the molecular force of differential density of heat. This remains in the molecules of the inert matter at the sun, or as long as this expansion lasts or is kept up, in the combustion, by feeding it upon suitable elements.

The life of all the phenomena of nature, therefore, depends entirely upon the constant feeding of inert matter, which can produce the chemical energy, from which the force of the differential density of heat, light, life, motion and other phenomena are all derived.

Seeing is that feeling caused by this force of differential density which is created by the energy at the combustion through the withdrawal of the same inert element of which the optical nerves are composed. When this draws upon those nerves the differential density it creates impresses them with the original image or the confusion of these images, and the result is light. When any object is then further illuminated by this confusion of images, it is still the first original force of differential density which acts and is felt. Even when the energy is applied to cause motion, which induces magnetism, electricity and heat, the final result of light is due still to the first original force of differential density of motion converted into light.

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